METHOD FOR PACKAGING AND PACKAGING APPARATUS

The present invention relates to a method for packaging and a packaging apparatus for the packaging of, for example, food such as meat products. In particular, the invention relates to a method of packaging and an apparatus which utilize a feed of packaging material in tubing form which is slit and unfolded to be formed around a fed product.

Methods and apparatus for the packaging of products, for example, food and in particular meat products, are broad ranging, various techniques being employed depending on the product which is to be packaged and the packaging material which is being used. Generally, conventional form, fill and seal packaging machines and processes involve the supply of packaging material in continuous sheet form, commonly referred to as single wound material. The sheet material is supplied having a width as required for the wrapping process in question. Generally, the width of the sheet material is up to about 700 mm. The sheet material may be produced in various ways including using extrusion techniques, or via the production of a tube of the material which is subsequently collapsed and slit to provide two flat sheets. These two methods have been traditionally used to supply sheet material for use in conventional form, fill and seal packaging practices.

The use of some types of plastic packaging materials may be somewhat limited when produced by conventional production methods due to limitations in the maximum possible widths of the flat sheets produced using these methods. In particular, materials which are necessarily extruded and blown into a vertical bubble to induce shrink characteristics generally suffer from pore bubble stability. That is, when the material in a semi-molten phase is inflated to a wider tube before the plastic sets, if the bubble is not stable due to the plastic properties and size of the bubble, then it may collapse ceasing production of the packaging material. Furthermore, and related to this, the accuracy and tolerances of the final packaging materials produced may be greatly affected using conventional production methods for flat sheet materials. More particularly, conventional processes of edge slitting the material to form two continuous flat sheets from a tube will produce flat sheets with variable width, the edges of which deviate quite markedly from a straight line.

The present invention advantageously provides a means for alleviating problems

related to variation in width of a single wound packaging material. The invention also advantageously provides a method and apparatus which may be economically viable in reducing production costs for the packaging material being used, and allows packaging materials to be run at widths which are not conventionally available. Still further, the invention advantageously provides a method and apparatus which may substantially avoid contamination of the product-contact surface of the packaging material prior to and during packaging of the product.

According to the present invention there is provided a method for packaging comprising the steps of:

(i) continuously feeding a packaging material as tubing from a supply;

(ii) slitting and unfolding the tubing to form a flat web of the packaging material;

(iii) forming the flat web of packaging material around a fed product and longitudinally sealing the packaging material formed around the product; and

(iv) cutting and sealing the packaging material at one or both ends of the product.

The fed product is, in accordance with conventional methods, generally fed as individual, spaced units of product, the flat web of packaging material being formed around each of the units. Subsequently, in step (iv) the packaging material which is formed and sealed around the product is cut at a location between units of product and sealed at one or both ends of the unit. In some instances it will be preferable that the packaging material be sealed at only one end so that the product is left in an open-ended bag. This will enable, if necessary, the subsequent vacuum sealing of the product in the bag. As such, in a particular embodiment, in step (iv) the packaging material is cut and sealed at one end of the product and the packaged product is subsequently vacuum sealed.

The method according to the invention utilizes a feed of packaging material in the form of tubing. This is quite different from the conventional form, fill and seal techniques which involve the supply of a flat single wound sheet of material which generally has been produced by edge slitting of a tube of material to form two flat sheets. In accordance with the method of the invention, as the packaging material is fed in tubing form and then slit and

opened out, it will be recognised that the width of the opened tubing, that is the flat web referred to in step (ii), will be twice that of conventionally used single wound material when that material has been produced by slitting of a tube to form two flat sheets. As such, according to the invention, if tubing is supplied having a double web width of up to about 550 mm, then the flat web formed by slitting and unfolding of the tubing will have a width of up to about 1100 mm. Such widths have generally been unavailable to date and, as will be recognised by those in the art, provide substantial advantages in the packaging of larger products.

The feeding of the packaging material in tubing form also removes costs related to the post-production conversion of conventional materials to flat continuous sheeting, for example, the edge slitting of a tube to form two flat sheets described above. The supply of tubing also means that the packaging material is not opened to the air prior to the slitting and unfolding of the tubing in step (ii) of the method. This fact substantially decreases the chance of contamination to the inner surface of the film which will form the inside or product-contacting surface of the packaging material.

In order to minimise variation in width of the flat web formed in step (ii), in a preferred embodiment during feeding of the tubing, the tubing is tracked to ensure that it is substantially centrally slit along its length. More particularly, the tubing is advantageously centrally slit along its upper or lower surfaces as illustrated in Diagram 2.2, although it may be possible to slit the tubing material along one of its edges to form the flat web as illustrated in Diagram 2.1.

After the slitting and unfolding of the tubing to form the flat web, the flat web of packaging material is formed around the product which is to be packaged and is longitudinally sealed to substantially reform the tubing originally fed from the supply. Due to the deviation in width of the flat web, on longitudinal sealing to reform the tubing, it will be recognised that there will be at least some excess packaging material along the longitudinal seal. Therefore, in a preferred embodiment, prior to or during the longitudinal sealing of the packaging material in step (iii), the packaging material is trimmed along its slit edges formed in step (ii) to remove excess packaging material therefrom. This trimming of the edge of the film is completed by a knife or shearing apparatus. The trimming function allows control of

the amount of excess material outside the longitudinal seal as illustrated in Diagram 3.1.

The cutting and sealing of the packaging material in step (iv), as discussed above, may include cutting and sealing at one end of the product and cutting and optionally sealing at the other end of the product depending on whether vacuum sealing of the packaged product is desirable. The cutting and sealing may be conducted by any suitable method, such as using conventional hot or cold sealing systems. According to one embodiment, the cutting and sealing of the packaging material is carried out by impulse sealing the packaging material at the end or ends of the product.

Vacuum packaging of the product would commonly involve evacuating the bag through the open end then sealing. The final package would contain no gas sealed inside with the packaged item. This could be completed by a vacuum nozzle or a vacuum chamber system. The final seal could be in the form of a clip or heat seal weld.

According to another aspect of the invention there is provided a packaging apparatus comprising:

means for receiving packaging material continuously fed as tubing from a supply, and slitting and unfolding the tubing to form a flat web of the packaging material;

calendering means for receiving the flat web and tensioning the flat web;

forming means for receiving the tensioned flat web and forming the flat web around a fed product;

sealing means for longitudinally sealing the packaging material formed around the product; and

end sealing means for cutting and sealing the packaging material at one or both ends of the product.

The slitting and unfolding means receives the continuous feed of packaging material in tubing form and slits and unfolds the tubing to form the flat web of the packaging material for subsequent calendering and forming around a fed product.

The calendering means may include any means which is suitable for tensioning the flat web to supply the forming means. In a preferred embodiment, the calendering means comprises a pair of spring clamped rollers which are adapted to ensure that the flat web is fed to the forming means at a consistent tension and angle. This calendering allows the apparatus

to be started and stopped during operation without the feed tension changing.

The forming means may comprise any suitable means for forming the flat web into a tubular shape around the fed product as will be understood by those skilled in the art. In a preferred embodiment, the forming means comprises a forming shoe which forms the flat web around the fed product.

The sealing means for longitudinally sealing the packaging material formed around the product may include any suitable means for longitudinally sealing the packaging material to substantially reform the material into its original tubing form around the fed product. The longitudinal seal is typically formed by a combination of heat and pressure which cause the two layers of material to weld or bond together. It is preferable that this joint is hermetic in nature. The heat and pressure are supplied typically by heated rollers with the film clamped therebetween. Variations of this include heated bands, drag wires, ultra sonic heating devices clamping the layers of plastic material and applying heat. An alternative method is to apply a cold bonding adhesive agent to both faces which may then bond to each other when pressure is applied.

The end sealing means may comprise any suitable hot or cold sealing systems which employ adhesive and/or heat to facilitate sealing of the packaging material at one or both ends of the fed product. The configuration of the sealing means is selected to cut and seal the packaging material at one or both ends of the product and may be determined, as discussed above, on the basis of whether subsequent vacuum sealing of the packaged product is desirable. That is, the end sealing means may be selected to provide a single seal adjacent a transverse cut in the packaging material or may be selected to provide a pair of seals which straddle a transverse cut in the packaging material. It will be recognised that the first of these options will produce an open bag containing the fed product. In a preferred embodiment, the end sealing means comprises an impulse sealing device which includes at least two complimentary jaw members which clamp the packaging material to form a transverse cut in the packaging material, and which form a seal on one or both sides of the formed transverse cut.

As discussed above in relation to the method according to the invention, when the apparatus is in use, the flat web formed by slitting and unfolding of the tubing of packaging

material will include some deviation in width. Therefore, in a preferred embodiment, the packaging apparatus preferably further comprises means for trimming excess packaging material from the flat web of packaging material to advantageously ensure that a longitudinal seal is formed along the length of the packaging material formed around the product which is a neat fin seal.

The packaging apparatus also preferably further comprises means to facilitate center tracking of the tube to ensure that it is slit centrally along its length by the slitting and unfolding means.

In order to completely automate the packaging apparatus according to the invention, it is preferred that the apparatus further comprise sensing means for auto-positioning of a product and successive products for end sealing. That is, preferably a sensing means is provided to sense when a product is in position for end sealing at which stage the conveyance of the product is stopped and an end seal formed or the sealing mechanism travels with the product forming a seal without halting the conveyance of the product. After completing the transverse seal, the sealing mechanism travels in the reverse direction to prepare for the following seal. By controlling the spacing of the product with respect to each other, the package or bag length can be controlled. In a preferred embodiment, the sensing is generally completed by optical sensors which detect the leading and trailing edge of the products. This is the method used in determining spacing of respective products and the final position of the transverse seal.

The invention will now be described in more detail with reference to the accompanying diagrams in which:

Diagram 1.1 illustrates a conventional form, fill and seal packaging apparatus;

Diagram 1.2 illustrates an embodiment of the form, fill and seal packaging apparatus according to the invention;

Diagram 2.1 illustrates the slitting and unfolding of the fed tubing material by slitting one edge thereof;

Diagram 2.2 illustrates the slitting and unfolding of the tubing material by slitting centrally on one face thereof;

Diagram 3.1 illustrates the trimming of excess edge material;

Diagram 4.1 illustrates the configuration of the packaging apparatus of the invention; and

Diagram 5.1 illustrates the transverse sealing sequence used in accordance with embodiments of the invention.

Referring to Diagram 1.1, a conventional form, fill and seal packaging apparatus feeds a single wound material from a roll (B). The film is unwound from the roll (B) and fed into the apparatus by a passive or powered unwind mechanism. Calendering of the unwound film is conducted in a calendering zone (C) where the material is adapted to ensure that it is supplied to the feed area of the apparatus at a consistent tension and angle.

Product to be packaged (D) is fed by a conveyor belt under the web of material to a forming device (E), commonly referred to as a forming box or forming shoe. The forming device (E) wraps the flat web of material around the incoming product (D) so that the flat web of material forms a tubular shape around the product. The material, when wrapped around the incoming product (D) may be folded in a manner which facilitates the production of a longitudinal seal. This may be achieved, for example, by forming a fin (F) or a lap in the material.

After wrapping of the flat web of material around the incoming product (D), a longitudinal seal is made in the material by a longitudinal sealing device (G) to seal the two edges of the wrapped material together to form a complete tube.

When the complete tube is formed around the product, an end sealing device (A) is used to seal the tube and cut the tube between successive products (D) to form a finished packaged product (H).

As discussed earlier, these conventional form, fill and seal packaging apparatuses are limited due to the limitations in the maximum possible widths of the flat sheets fed from the roll (B).

The invention, however, as illustrated in Diagram 1.2, feeds a tubing material (J) from a roll (K) of packaging material in an integral tubing form. In this case, the apparatus is provided with a slitting and unfolding device (L) which makes a continuous cut in the tubing material (J) and folds or forms the cut tubing material into a flat sheet. The slitting and unfolding device uses a set of geometric plates and frames to ensure the alignment of the

material does not vary in the process.

As will be seen in Diagram 1.2, the following calendering of the slit and unfolded material is achieved by a pair of sprung clamped rollers in a calendering zone (C). The remaining packaging of the product (D) by a forming device (E), longitudinal sealing device (G) and end sealing device (A) may be conducted in line with conventional methods.

Referring to Diagrams 2.1 and 2.2, the slitting and unfolding device generally comprises a back unfolding plate (1.1) and a front unfolding plate (1.2).

In Diagram 2.1, the tubing material is slit along one edge thereof by the slitting and unfolding device. In this regard, the raw tubing material (A) is fed into the device and slit at an edge slitting point (B). Following slitting of the tubing material, the back layer (C) of the film folds to travel 90° from the original infeed path, and the front layer (D) of the film travels in a direct path. The back layer of the film travelling at 90° from the original infed path (E) travels between the front unfolding plate (1.2) and the back unfolding plate (1.1) until it is folded to travel at 180° (F) from the original infed path. Following this operation, a final single web of film (G) exits the slitting and unfolding device at 180° from the original infed path of the tubing material.

It should be noted that the angle (H) of the back and front unfolding plates (1.1, 1.2) are identical angles between 30° and 60°.

The slitting and unfolding device illustrated in diagram 2.2 utilizes the central slitting of the tubing material (A).

In this case, a central slitting point (B) is provided on the back face of the tubing material (A). The back layer of the slit film (C) is then folded to travel at 90° from the original infeed path. The front layer (D) of the film travels in a direct path. As was the case in Diagram 2.1, the back layer of film travelling at 90° from the original infeed path (E) passes between the front unfolding plate (1.2) and the back unfolding plate (1.1). The back layer of the film is then folded to travel at 180° (F) from the original infeed path. The final single web of film (G) exits the slitting and unfolding device at 180° from the original infeed path of the tubing (A).

As was the case in Diagram 2.1, the angles (H) provided by the plates are identical angles between 30° and 60°.

Referring to Diagram 3.1, excess material (E) is advantageously trimmed from the packaging material at a point (C), and a longitudinal seal (D) applied to the trimmed material to complete the tube. This procedure advantageously removes inconsistent edges (B) of the packaging material generally present due to inconsistencies and variations during the manufacture of the tubing material.

A further illustration of the packaging apparatus according to the invention is provided in Diagram 4.1. As illustrated in this diagram, the tubing material is unwound from a roll (B) and slit and unfolded using a slitting and unfolding device (C). The slit and unfolded material is then fed as a single web to a tensioning and feeding calender (D) and then onto a forming or folding box (E). After forming or folding of the single web material by the forming or folding box (E) product (A) is fed into the formed material and an edged trimming device (F) used to trim the edges of the material. Following this, a longitudinal sealing device (G) is used to seal the material to form a complete tube. Scrap or edge trim material is removed by a suitable waste removal device (H).

Sealing of the formed tubing material about the product (A) is conducted by means of a pair of transverse sealing jaws (J) which are mounted for complementary movement towards each other. These jaws may either form a pair of transverse seals and cut the tubing material between the pair of seals, or may seal only one side of the tubing material and cut the material adjacent the seal. In the first case, the product (A) is completely enclosed as the final package (L), whereas in the second instance the product (A) is conveyed out of the apparatus in an open bag as the final package (L).

In any event, the product (A) is conveyed by means of a main transport conveyor belt (K), and the packaging of the product (A) controlled by a machine control panel (M).

As previously discussed, the apparatus preferably includes sensors (not shown) which determine the position of the product (A) relative to the sealing jaws (J) so as to determine operation of the sealing jaws (J) to seal between subsequent products (A).

The transverse sealing sequence is better illustrated in Diagram 5.1. The sequence includes the lowering of the jaws (A, B) toward the material (C) until the jaws are in a closed position. In this position, sealing means (D) on each jaw (A, B) form a pair of longitudinal seals in the material (C). Simultaneously, a blade (E) forms a cut in the material between the pair of seals formed by the sealing means (D). The sealing means (D) may include

conventional means such as thermal bands.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or group of integers or steps but not the exclusion of any other integer or group of integers or steps.

Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described. It is to be understood that the invention includes all such variations and modifications. The invention also includes all of the steps, features, compositions and compounds referred to or indicated in this specification, individually or collectively, and any and all combinations of any two or more of said steps or features.